REMARKS

Claims 2-16 remain in the application.

A substitute specification is filed herewith under 37 CFR 1.125(b) replacing the specification (except for drawings) that was originally filed. The substitute specification contains no new matter. The sole claim in the substitute specification is canceled by the above amendment. A copy of the marked up version of the original specification shows the changes that were made.

The Examiner has rejected Claim 1 as failing to define the invention in the manner required by 35 U.S.C. §112, ¶2. This claim has been canceled and replaced by claims more typical in US practice. Accordingly, this rejection should be moot.

The Examiner has rejected Claim 1 under 35 U.S.C. §102(b) as being anticipated by Simpson et al. (US Patent 5,142,837, hereafter Simpson). The rejection should not apply to the newly submitted claims for at least two reasons.

First, the organic resin is now recited to not contain asphalt, as supported in the substitute specification at page 4, lines 8 and 9. In contrast, Simpson's laminate of aluminum foil 18, ionomer resin layer 22, and polyethylene layer 20 are adhered to the roof 12 (after removal of the related paper 26) by an asphalt layer 24.

Secondly, the composite film is recited to contain an aluminum layer laminated between two copolymer layers. In contrast, Simpson fails to suggest a top polyethylene layer, which can be used to protect the aluminum layer from scuffing. Furthermore, the two thermoplastic copolymer layers allow two overlapping strips to be welded together by heated air.

Some of the claims require the resin to be viscoelastic when the roof system is in use. In contrast, Simpson's asphalt is known to harden in use.

Further, other claims require the resin to be applied to the roof and then the composite is applied to the resin. In contrast, Simpson applies the asphalt to the composite to form a thicker composite and then applies the thicker composite to the roof.

Yet other claims recite the thermal bonding of the overlapping portions of neighboring strips. No such feature is found in Simpson.

A copy of the International Preliminary Examination Report is submitted herewith. It is noted that two references were cited therein.

In view of the above amendments and remarks, reconsideration and allowance of all claims are respectfully requested. If the Examiner believes that a telephone interview would be helpful, he is invited to contact the undersigned attorney at the listed telephone number, which is on California time.

Respectfully submitted,

Date: 12 June 2001

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Version with markings to show changes made

Please cancel Claim 1.

Please add the following new claims:

2. (New) A waterproofed roofing system for application over a roof surface, comprising:
an adhesive organic resin layer not containing asphalt and applied over said roof surface, said resin layer being visco-elastic after completion of said system; and
a composite film applied to said resin and including a central aluminum layer laminated between respective thermoplastic copolymer layers.

3. (New) The roofing system of Claim 2, wherein said resin layer allows sliding motion between said composite foil and said roof surface when said roof system is ready to use.

4. (New) The roofing system of Claim 2, wherein said roofing surface comprises concrete and said resin layer is applied directly to said concrete.

5. (New) The roofing system of Claim 2, wherein said roofing surface comprises a mud slab layer and said resin layer is applied directly to said mud slab layer.

6. (New) The roofing system of Claim 2, wherein said roofing surface includes a porous matrix having capillaries into which said resin layer penetrates.

7. (New) The roofing system of Claim 2, comprising a plurality of strips of said composite film applied over said resin layer and having overlapping edges welded together.

8. (New) The roofing system of Claim 2, wherein said roofing surface includes a parapet and further comprising screws fastening an edge of said composite film to said parapet.

9. (New) A roofing method, comprising the steps of:
a first step of applying over said roof surface an adhesive organic resin layer not containing asphalt;
a subsequent second step of applying over said resin layer a strip of a composite foil including a central aluminum layer laminated between respective thermoplastic copolymer layers.

10. (New) The roofing method of Claim 9, wherein said roofing surface includes a parapet and further comprising fastening an edge of said strip to said parapet with mechanical

fasteners.

11. (New) The roofing method of Claim 10, wherein said resin layer is visco-elastic after said fastening step.

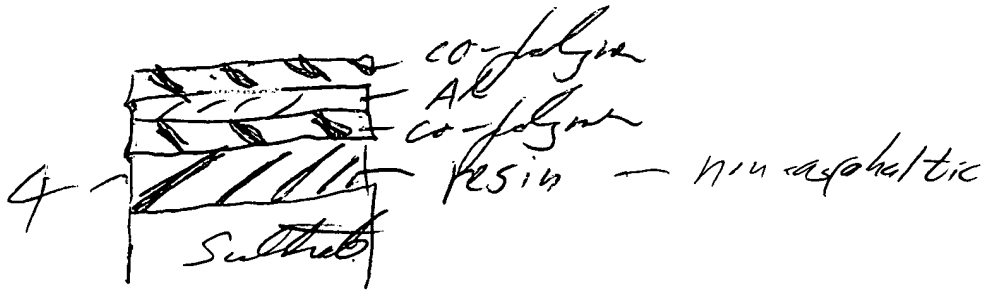
12. (New) The roofing method of Claim 9, wherein said second step applies over said resin layer a plurality of said strips having respective edges overlapping.

13. (New) The roofing method of Claim 12, further comprises heating at least one of said overlapping edges to thereby attach adjacent ones of said strips.

14. (New) The roofing method of Claim 13, wherein said heating step includes applying heated air.

15. (New) The roofing method of Claim 13, wherein said heating step melts said thermoplastic copolymer layers of said adjacent ones of said strips, thereby welding them together.

16. (New) The roofing method of Claim 9, wherein said resin layer is visco-elastic after said method has been completed.


co-polymer
Al
co-polymer
4
resin — non-asphaltic
Substrate

A ROOF WATERPROOFING SYSTEM CONSISTING OF AN ORGANIC RESIN PROTECTED BY AN ALUMINUM-COPOLYMER COMPOSITE FOIL

FIELD OF THE INVENTION

The present ~~Utility Model~~ is related to ~~a technique for~~ protection of exposed building roofs, consisted of cementitious ~~(or not)~~ substrate, against percolation of water, that ~~conjugates~~, in one system, two ~~processes~~ that confer watertightness to the roof, providing larger reliability to the surfaces against the percolation of water.

BACKGROUND OF THE INVENTION

At present, the factory-prepared systems which are ~~destined~~ to ~~obtain roof watertightness~~ (except the conventional roofs ~~in~~ clay tile, fiber-cement or metallic elements) are mainly constituted of prefabricated asphalt-based, asphalt-elastomeric or pure elastomeric impermeable films.

The factory-prepared asphalt-based and asphalt-elastomeric sheets have usually an internal reinforcement provided by polyethylene films, non-woven polyester or non-woven fiberglass. Elastomeric films, particularly the fluid-applied elastomers, do not usually contain reinforcement in ~~its~~ interior, although some polymeric manufactured sheets do ~~it~~ to provide added strength and puncture resistance. These films are applied on a structural substrate (e.g. concrete slabs), sometimes regularized by cimentitious mortar. The mortar is used to create a surface free ~~from~~ angular ~~points~~ and depressions besides ~~granting~~ suitable slope for water flow.

Some of these materials are applied to the mud slab through previous application of an appropriate asphalt-based primer, used to fix the films strongly to the substrate. Primer is ~~cold~~-applied, but film attachment to the primer is ~~executed~~, often times, through ~~hot~~-process, by means of a torch.

In order to protect the film against the deleterious effect of ultraviolet rays, some roofing materials ~~show~~, in one of their faces, an element ~~in order~~ to impede such effects

on the asphalt-based material. Usually, this element comprises an appropriate elastomer. ~~(Patent at USPTO under number 4,775,567): "A~~ A waterproofing laminate suitable for use in roofs, floors, or other surfaces where waterproofing is desired, comprises an elastomeric sheet secured to a modified bitumen layer and a release sheet secured to the modified bitumen layer. Certain preferred materials for use in the laminate are recited." (US Patent 4,775,561) crushed slate powder, or thin aluminum film facing, surfacing one side of the asphalt-based sheet.

These prefabricated sheets are meant for roofs with eventual or sporadic traffic, usually necessary for maintenance or cleaning operations. Such facing materials do not give mechanical protection to the sheets, but they do protect them against the incidence of ultraviolet solar rays. On the other hand, infrared rays are also reflected by the aluminum facing, improving thermal comfort conditions on the environment protected by the referred sheets.

There are, still, factory-prepared asphalt-elastomeric membranes, in which one face presents self-adhesive finish and the other face receives, as in the previous case, a thin film facing of aluminum. (Patent at USPTO under numbers 4,936,938; 5,096,759, and 5,142,837): "A laminated roofing material includes an aluminum foil top sheet laminated to a polyethylene film by an ionomer resin. After the sheets are bonded together they are cooled to set the resin and an asphalt (bitumen) coating is applied to the exposed polyethylene sheet and covered with a release paper. The roofing material is applied over an underlayment to form a roof supported by conventional sheeting material."

Such a material has several applications in the building construction sector, as for example, the recovery of metallic roofs which present leakage caused by oxidation and consequent perforation of the roof metallic cover. In this case, primers are not

used, ~~as~~ because one of the material faces is already ~~has an~~ adhesive ~~element~~, provided that the substrate is absolutely clean and dry to promote attachment.

The main disadvantage in the case of the aluminum-faced membranes resides in the low mechanical resistance of the coating on the exposed face. As the aluminum film is extremely thin (about 35 to 50 micrometers), it is subject to the damaging mechanical ~~actions~~ effects which may expose the asphalt-based portion of the membrane to the ~~ultraviolet~~ UV solar rays.

Another quite common occurrence in the usage of asphalt-based or elastomeric sheets to building construction roofs is the difficulty ~~to locate~~ in locating eventual defects that could lead to the failure of watertightness ~~failure~~. The infiltration can be caused by a flaw in lateral or longitudinal welding of the membrane strip overlaps or even by involuntary perforation in the sheet. Water penetrates through the flaw, reaches the mud slab and percolates into the interior of its porous matrix under the roofing membrane, until it finds a defect in the cimentitious substrate (e.g. a joint, a "bug hole"), making the leakage visible on the inside of the building. Most of the time, the point at which the leakage becomes visible does not coincide with the position of the failure which caused the leak. Moreover, as primer attaches the sheet firmly to the deck, ~~in case~~ if a dynamic crack appears in the substrate due to structural movements (e.g. severe climatic thermal gradients), the new joint will probably propagate to the roofing material, splitting it at this position and allowing water to enter the split.

SUMMARY OF THE INVENTION

With the objective of solving such inconveniences, the present system was developed, through which substrate watertightness is assured by two processes: first, an organic, flexible, hydrophobic, self-leveling and viscoelastic composition resin is applied directly on the structural substrate to be treated, sealing the pores in its surface; second, an impermeable aluminum foil laminated with thermoplastic copolymers is adhered to the surface by the organic resin.

The advantages of this system when compared to the existing ones are as follows: a) it offers relatively large resistance to involuntary mechanical injuries on the foil, due to the presence of larger film thickness (about 300 micrometers); b) its watertightness results from two different processes; in the ~~hypothesis~~ event that a severe mechanical ~~injury causes~~ accident perforates the foil ~~perforation~~, the structure will stay tight as its pores remain sealed by the organic resin action; c) the ~~fact that the~~ system permits its being applied directly over the concrete deck structure, eliminating the need of previous ~~execution~~ deposition of mud slab, which is indispensable in the prevalent waterproofing systems, and there leading to greater economic feasibility; d) the system can also be applied over mud slab substrates, although direct application on concrete deck structure is preferable; e) the ease and economy in ~~the~~ locating ~~of the~~ leak-causing flaw during ~~when~~ flood test ~~is in~~ progress, if the proposed system is applied directly on the concrete deck structure; and f) the resin, being viscoelastic, allows reasonable adherence of the film composite to the substrate, admitting the possibility of small sliding motion between them; this characteristic is ~~the one~~ responsible for the integrity of the film if ~~in the circumstance of~~ a dynamic crack arise on the deck, as such crack is not transmitted to the film, since it slides on the resin layer without breaking, ~~differently from~~ in distinction to asphaltic or asphalt-elastomeric sheets which are intimately stuck to the substrate by means of primers.

The invention can be better understood through the following detailed description, in consonance with the drawing enclosed, where:

~~ILLUSTRATION~~ Fig. 1 shows the plan of a surface on which the proposed system was applied.

~~ILLUSTRATION~~ Fig. 2 shows the longitudinal section of a surface on which the proposed system was applied.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT / FIGS.

~~ILLUSTRATION~~ 3 shows the traverse section of a surface on which the proposed system was applied.

With regard to these illustrations, it can be observed that the organic resin (4) is applied over the deck structure (1) and its baseboards or parapets (2). This resin (4) has high attachment power to porous and non-porous substrates, besides having self-leveling, hydrophobic and viscoelastic characteristics; in the specific case of the porous substrates, the material sticks to the surface, penetrating the external capillaries of the porous matrix and sealing them. Therefore, this material renders the porous surface totally impervious to water and, as the resin is highly flexible, it allows deck's small structural movements in the deck without loosing watertightness.

Over the substrate, previously treated with the mentioned resin, a composite film (5) of aluminum laminated on both faces with thermoplastic copolymers is applied in a way so as to protect the resin (4) against the harmful action of ultraviolet solar light. ~~The~~ welding (7) of the several strips of the composite, in the longitudinal direction, is done by the application of heated air, through appropriate equipment and temperature, in the overlapping interface of two adjacent strips of the composite film 5. The copolymer which laminates the aluminum foil is thermoplastic and allows to be melted with heated air, attaching the adjacent sheets on the overlapping strip. No bonding materials are needed for this purpose.

~~For better fastening of the composite strip edges to the deck, screws are used (6),~~ Screws 6 are advantageously used to fasten the edges of the composite film 5 together; endowed with plastic washers, attached in common expansion shells that are introduced inside appropriate holes, performed in the structure of the baseboards and parapets (2).

The rain water, collected on the treated surface, flows through a ~~pipeline (3)~~ drain pipe 3 of PVC or other material ~~destined~~ used for that purpose.

CLAIMS

1- A ROOF WATERPROOFING SYSTEM CONSISTING OF AN ORGANIC RESIN PROTECTED BY AN ALUMINUM-COPOLYMER COMPOSITE FOIL, characterized by the application, on exposed porous or non-porous surfaces (1), mud slab regularized or not, of concrete, wood, metals, etc., besides baseboards and parapets (2), of high adherence non-asphaltic organic resin (4), with self-leveling, viscoelastic, thermoplastic and hydrophobic properties, covered by film strips (5) of aluminum laminated with thermoplastic copolymers, welded at its overlaps (7) by thermal process, fastened in the vertical surfaces of the structures by screws/plastic washers/expansion shells groups (6), and whose flow of rain water is made by pipeline (3) in PVC or other equivalent material.

replace w/ new claims

~~SUMMARY~~ ABSTRACT OF THE DISCLOSURE

" A ROOF WATERPROOFING SYSTEM CONSISTING OF AN ORGANIC RESIN PROTECTED BY AN ALUMINUM-COPOLYMER COMPOSITE FOIL ".

~~The present Utility Model, that conjugates in one~~ A roofing system, two ~~processes~~ techniques including that confer watertightness to exposed substrates, cimentitious or not, used on roofs of current buildings, ~~provides~~ The system increases the larger reliability to the surfaces against the percolation of water.

The ~~said~~ system ~~is constituted of~~ includes the process of applying, on exposed porous or non-porous surfaces (1), mud slab, regularized or not, of concrete, wood, metals, etc., ~~besides~~ on top of baseboards or parapets (2), of high adherence organic resin (4), ~~with~~ that is self-leveling, viscoelastic, thermoplastic and hydrophobic ~~properties~~, covered by film strips (5) of aluminum laminated with thermoplastic copolymers, thermally welded at its overlaps (7) by a thermal process, and fastened in the vertical surfaces of the structures by screws/plastic washers/expansion shells ~~groups (6), and whose~~ and the flow of rain water is made by pipelines (3) in PVC or other equivalent material.